

STAGES OF PRE-NATAL DEVELOPMENT

During this presentation refer to the “TIMELINE OF PRENATAL DEVELOPMENT”.

- Day 1 - conception takes place.
- 7 days - tiny human implants in mother’s uterus.
- 10 days - mother’s menses stop.
- 18 days - heart begins to beat.
- 21 days - pumps own blood through separate closed circulatory system with own blood type.
- 28 days - eye, ear and respiratory system begin to form.
- 42 days - brain waves recorded, skeleton complete, reflexes present.
- 7 weeks - photo of thumbsucking.
- 8 weeks - all body systems present.
- 9 weeks - squints, swallows, moves tongue, makes fist.
- 11 weeks - spontaneous breathing movements, has fingernails, all body systems working.
- 12 weeks - weighs one ounce.
- 16 weeks - genital organs clearly differentiated, grasps with hands, swims, kicks, turns, somersaults, (still not felt by the mother.)
- 18 weeks - vocal cords work – can cry.
- 20 weeks - has hair on head, weighs one pound, 12 inches long.
- 23 weeks - 15% chance of viability outside of womb if birth premature.*
- 24 weeks - 56% of babies survive premature birth.*
- 25 weeks - 79% of babies survive premature birth.*

(*Source: M. Allen et. al., "The Limits of Viability." New England Journal of Medicine. 11/25/93: Vol. 329, No. 22, p. 1597.)

Introduction/ Summary:

The duration of pregnancy is divided into three equal segments called trimesters. The first trimester (months 1-3) is essential to the proper development of the infant and encompasses both the ovum and embryonic period of prenatal development. This is when all organs, nerve cells and brain cells develop. This is when most spontaneous abortions (miscarriages) occur. They generally are caused by abnormal development of the fetus and are nature’s way of eliminating a chromosomal abnormality. It is vital that all necessary nutrients be available to the fetus in order to develop properly.

The second trimester (months 4-6) is often referred to as the “Golden trimester”. This is when the mother generally feels the best. Morning sickness and nausea have generally disappeared and the mother is quite comfortable.

The third trimester comprises months 7-9. These are important months for the baby as its organs and body systems mature and prepare to function on their own. The fat accumulated during this time will give the baby a “head start” on life.

The prenatal development is sometimes separated into three development periods. The first period is referred to as the period of the zygote. This stage begins at conception and lasts until the zygote

is implanted in the mother's uterus. It lasts for about 10-14 days. The zygote grows to be about the size of a pinhead. Roots grow from the zygote into the wall of the uterus where they can receive nutrients from the mother's blood.

The period of the embryo lasts from about 2 weeks to 8 weeks after conception. The embryo is attached to the mother by the umbilical cord (20 inches long) which reaches from the embryo's stomach to the wall of the uterus. The umbilical cord contains arteries which carry the embryo's waste products away from the embryo to the mother's blood system to be purified. It also brings oxygenated and nutrient-rich blood back to the embryo to keep it alive. The umbilical cord is connected to the placenta. The placenta is an organ which serves as a medium for the exchange of nutrients and waste between the mother and the fetus. Throughout this period, the embryo is inside the amniotic sac (a bag filled with watery substance called amniotic fluid). The fluid will protect the developing baby against bumps, bruises and temperature changes. During this period all of the organs that will be present at birth are formed.

The third development period is called the period of the fetus. This period extends from the end of the second month of pregnancy until birth. During this stage, the developing baby is referred to as a fetus. The body parts, organs and systems which were formed during the embryo period will become much more developed and begin to function. The fetus will begin to resemble a human being and features will increase in clarity.

During the fetal period the baby may increase in length as much as twelve inches.

MONTHLY DEVELOPMENT

Month 2 – The embryo increases in length to about 1 ½ inches. Bones and muscles begin to form. The head grows rapidly at first, accounting for about half of the embryo's size. The face and neck begin to take on human form. The brain develops very rapidly. Leg and arm buds form and grow the eyes begin converging toward the center of the face. The mouth and nose form. Major organs of the digestive system become differentiated. The heart has been beating for about a month now.

Month 3 – The fetus measures about 3 inches from head to buttocks and weighs about ½ ounce. The fetus has all of its major systems and they are functioning. However, it is still unable to survive independently. No new organs will need to be formed, but the ones that are present will need time to develop and mature. The digestive system is active. The liver and kidneys are functioning. The fetus practices swallowing amniotic fluid, breathing amniotic fluid and its vocal chords are developing. The roof of its mouth comes together and fuses. Taste buds appear, sex organs continue to develop, buds for all temporary teeth are formed and bone formation begins. During this month, arms, legs and fingers begin to make spontaneous movement. The eyelids close and are sealed shut at this time. They will reopen at about 6 months.

Month 4 – The fetus grows to almost 6 inches in length and 4 ounces in weight. The skin is thin, loose and wrinkled and appears red because of underlying blood vessels. The face acquires a

human appearance. The body outgrows the head at this time. Hands and feet become well formed and finger closure is possible. The fetal reflexes become more brisk as it begins to stir and move the arms and legs. In males, the testes are in position for later descent into the scrotum and in females, the uterus and vagina are recognizable.

Month 5 – The fetus is now about 12 inches long and weighs about 8 ounces. During this month the mother will probably feel the baby's movement, called quickening. It is suspended in a quart of amniotic fluid. The development seems so advanced that the skin and digestive organs are not prepared to exist on their own. Also, there is no provision for regulating body temperature. The fetus grows a fine dark body hair called lanugo and collects vernix, which is a waxy coating to cover and protect the skin. The nose and ears begin ossification, the skeleton hardens, and the heartbeat can now be heard. Fingernails and toenails begin to appear and the baby will wake and sleep. Sweat glands are formed and functioning.

Month 6 – The fetus increases in weight and is now between 1 ½ - 2 pounds. The eyelids, which have been fused shut, are now open and completely formed. The eyes look up, down and sideways. Eyebrows and eyelashes are well defined and taste buds appear on the tongue and in the mouth.

Month 7 – The fetus is now about 15 inches long and weighs between 2 ½ - 3 pounds. It can cry weakly and can suck its thumb. The fetus can make a variety of reflex movements: startle, grasp, and swim movements. The cerebral hemispheres cover almost the entire brain.

Month 8 – The fetus will gain 2-3 pounds during this month, which it will need to stay warm following birth. The fingernails reach beyond the fingertips and much of the lanugo is shed. By the end of this month, the fetus will most likely settle into the head down position. However, the baby is capable of changing positions.

Month 9 – The fetus reaches full growth. It measures 14-15 inches from head to buttocks and weighs 6-8 pounds. During this last month, the baby acquires antibodies from its mother which will give it temporary immunity against some diseases. The eyes are normally blue at birth because pigmentation is not normally formed until after a few weeks of exposure to light. Vernix is present over the entire body. The fetus will alternate between periods of activity and periods of quiet. The organs increase their activity, the fetal heart rate increases to rapid rate. Birth usually occurs approximately 280 days after the first day of the mother's last menstrual period.

TRIMESTERS

FIRST TRIMESTER

The Mother

There are many signs and symptoms that help determine pregnancy.

The first and most obvious change is missing a menstrual period. Usually with this symptom a woman will suspect pregnancy, although some women may miss two periods (if their cycle is not regular) before suspecting pregnancy.

A simple urine test from the doctor will show whether or not a woman is pregnant.

Home pregnancy tests are available for \$10-\$15 and are quite accurate, but are no substitute for a doctor's test or visit. (Most doctors will give their own test anyway!)

Other changes that take place in the woman are as follow:

Morning sickness/nausea: this probably occurs due to the change in hormones or a drop in blood level. Morning sickness does not just take place in the morning. Many women say it is associated with smells or foods they eat. Not much can be done to cure morning sickness. (Drugs or over-the-counter stomach remedies should not be taken.) watching the diet can help relieve some of the symptoms. Your doctor may recommend eating several small meals through out the day and/or eating something before getting out of bed, such as crackers. Also, there is a vitamin B6 shot the doctor can give that seems to help many women.

Frequent urination: Because the uterus lies next to the bladder, the changes in the uterus cause crowding. Therefore, the need for urination is increased.

Cravings: Unusual food cravings are also common during pregnancy. Giving in to them once in a while is all right. If you crave non-food items, consult your doctor.

Breasts: Swollen, tender breasts are common in pregnancy. This may occur before the menstrual period is missed. The breasts will enlarge a lot during the first few months. Although nothing will prevent stretch marks, lotions can relieve the tightness and itching associated with pregnancy.

Fatigue and Dizziness: these are two common symptoms of early pregnancy. To alleviate dizzy spells, get up slowly. To help with fatigue, get plenty of rest and eliminate unnecessary physical exertion. However, maintaining a regular pre-pregnancy exercise program can be most beneficial as long as it is with your doctor's approval.

The Baby

During the first trimester many changes take place for the baby. At four weeks the embryo is approximately ¼ inch long and its heart has started to beat. By six weeks after fertilization the embryo is about 5/8 inch long and has developed most of its vital organs. Its bones are still soft but the skeleton is well-formed. The arms and legs are forming. At eight weeks the embryo officially becomes a fetus.

In two months the mother has missed two menstrual cycles and her body has created a completely new individual.

By the ninth week the fetus floats in the amniotic fluid and is nourished from the placenta through the umbilical cord.

At twelve weeks the fetus is 2 ³/₄ inches long. Most of its organs are working, including the kidneys. Its arms, legs, hand, fingers, etc. are fully developed. The nails on its fingers and toes are starting to develop.

The Mother

At the end of three months the baby is essentially complete. From now on the mother's uterus is busy helping the growth and perfecting of the baby.

The doctor should be called immediately if any of these symptoms occur:

1. Vaginal bleeding
2. Sharp abdominal pain or cramping
3. Loss of fluid from the vagina
4. Severe or prolonged nausea or vomiting
5. Frequent dizzy spells
6. Painful urination
7. High fever over 100°F
8. Vaginal discharge that is irritating

Some other things to consider:

1. Do not take any medication unless approved by your doctor. This includes over-the-counter drugs.
2. No drugs or alcohol. These have a tremendous effect on the baby.
3. No X-rays. Radiation can interfere with cell division and organ development.
4. No saunas and hot tubs. The high and prolonged temperatures can be harmful to the fetus.
5. Vaccinations. Because vaccinations are live viruses, these should not be taken during pregnancy. However, do vaccinate the children in your home to protect them against these deadly diseases.
6. Cats. A parasite found in cats, cattle, sheep, and pigs can cause a disease in humans called Toxoplasmosis. This can cause severe damage to an unborn child. Because of this risk, you should avoid undercooked meat and changing cat litter boxes.

SECOND TRIMESTER

The Mother

The woman's body has many changes taking place:

- Skin:** each woman's body reacts differently to pregnancy. Skin may become oily. Dry, scaly, etc. the skin must stretch over the growing uterus. Therefore, stretch marks appear often. Facial skin may darken. This is called Chloasma or the mask of pregnancy. Staying out of the sun can help but usually there is nothing that can be

done to prevent it. It usually disappears after pregnancy. Another area that darkens is a line from the navel to the pubic hair. This is called Linea Nigra. This line disappears after pregnancy. Many women have this line – some darker than others.

Emotions: Because of the hormonal changes within the woman's body, she may experience mood swings, depression, and even bad dreams. She simply must adjust and realize that the moods will pass. She may need a few extra breaks or time to relax. She should not blame herself but realize that this is normal with all of the changes taking place in her life.

The Baby

By the fourth month the fetus is about two inches long. The first outlines of the face are showing. The muscles have developed and the baby is beginning to move. The baby weighs about $\frac{3}{4}$ of an ounce (the weight of an ordinary letter). The umbilical cord and placenta are now the source of nourishment from the mother. By the fifth month the fetus is six inches long and is completely formed. The baby's movements are noticeable to the mother and she will feel them regularly. The skull bones are the most important bones being developed at this time. These will not complete development until after the baby is born. The sixth month is just past the half-way mark. The eyes are now fully developed. The ears are complete. There is a lot of evidence to show that the baby can hear the outside world. The sounds are probably muffled, maybe like sounds under water. It is also believed the baby can hear the mother's voice and heart beat and, of course, the rumbling of her stomach. Fingerprints are formed.

THIRD TRIMESTER

The Mother

The most obvious change that takes place in the third trimester is the woman's body. The abdomen enlarges and fatigue is common.

The baby moves a lot now. The mother should feel it move every couple of hours. If she does not, she should call her doctor. Generally expectant fathers take more interest during this last trimester. This is because they can feel the baby move and the reality of the impending birth makes them anxious and excited.

A lot of women become more interested in how their bodies function during pregnancy, especially with a first pregnancy. They read everything they can to learn about this process.

There are some common discomforts many women experience during the third trimester:

1. Heartburn is caused by the large size of the baby and the stomach being pushed up. Usually cutting down on the size of meals will help with this problem. Eating several small meals is suggested. Another help is cutting out greasy and spicy foods. Again, the caution, do not take any over-the-counter medicines without your doctor's approval.
2. Shortness of breath is due to the size and activity of the baby. Taking deep breaths is a difficult task. Before delivery the baby "drops," making breathing easier.
3. Some women experience heart palpitations. The body volume has increased and sometimes the heart has to work overtime. However, the heart can stand the strain.

4. Leg cramps are common, especially late in the pregnancy. These are often called “Charley Horses.” The woman must walk them off or relax until they subside. Providing the body with plenty of calcium is important. Sometimes taking extra calcium is helpful.
5. Round ligament pains. Because of all the pressure on the ligaments in the lower abdomen, a mild to moderate pain sometimes occurs. There is a product called a SLING available at women’s personal departments. This helps support the abdomen and back, relieving pain and discomfort.

The Baby

The last trimester is mostly a time for the baby to grow and develop by developing a layer of fat. The organs develop and get ready for the baby to be born. The lungs develop in preparation for breathing and the baby is now head-down. It does not have room to roll around as in previous months. It still moves, but is not as active in the last few weeks because of limited space. By the end of the 38-40 weeks, the baby “drops” – giving the mother a little breathing space.

DANGER SIGNALS

As in the other trimesters, there are danger signals to watch for:

- Vaginal bleeding
- Sharp abdominal pain/cramping
- Loss of fluid
- Frequent dizzy spells
- Visual disturbances
- Nausea or vomiting
- Sudden and excessive swelling of face, hands, and feet
- Headache
- Burning, painful urination
- Fever
- Vaginal discharge

Call your doctor if any of these problems occur.

The recommended weight gain for an average woman during pregnancy is 25 to 30 pounds. This weight is distributed as follows:

- Baby – 7 ½ pounds
- Placenta – 1 ½ pounds
- Uterus – 2 pounds
- Amniotic Fluid – 1 ½ pounds
- Extra blood volume and water retention – 4 ½ pounds
- Breast tissue – 3 pounds
- Maternal stores of protein – 4 pounds